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Control of Carnivore Overpopulation (Egyptian Mongoose and Red Fox): Study Case in the Council of Azambuja (Portugal)

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Abstract. The presence of predators in a habitat is considered a stabilizing force in the population of herbivores, contributing to the balance of the ecosystem. However, the predator's overpopulation causes a drastic reduction of primary consumers, exceeding the capacity of the ecosystem and endangering the entire food chain. To solve that situation, density control actions are being implemented by man, for balance maintenance purposes or to prevent damages. Often, in the council of Azambuja, there are carried out these actions, by Hunting Associations to control the carnivore population in forest areas, in particular the egyption mongoose (Herpestes ichneumon) and the red fox (Vulpes vulpes), for their allegedly effect on the lagomorphs population decline.

The objective of this study was to describe the capture process end-to-end: how the authorization is required, how is it done in the field, how the fiscalization is made and the results on the biodiversity.

The methodology used was the record of the process, interview of the people responsible in field for these actions, and consultation with the national authorities involved.

It was verified that the national services which controls these actions (National Institute for Nature Conservation and Forestry) and responsible for the evaluation of the licenses requests, issued these ones to a local hunting association, without any previous study of those two species population's densities or maximum carrying capacity of the environment for them. There's no effective supervision of the implementation of this action in the field. It was also clear that hunters use these actions, not to guarantee the ecosystem balance, but to eliminate predators in order to increase the lagomorph's population for the hunting season. So a process that first established the ecosystem's balance can and may do exactly the opposite.

Keywords. Vulpes vulpes, Herpestes ichneumon, overpopulation control, ecosystem balance

1. Introduction

Biodiversity is characterized by the connections between the living beings on a community and for their genetic richness. One factor that promotes biodiversity is the balance between primary and secondary consumers and their population height on the food web. Therefore, the increase or decrease on the species effective, affects all the others which whom they have direct or indirect relations. In Portugal, the wild rabbit (*Oryctolagus cuniculus algirus*) it´s an extremely important lagomorph for the habitat maintenance, being the main prey for numerous carnivore species, like the iberian lynx (*Lynx pardinus*) and the spanish imperial eagle (*Aquila adalberti*) [1], and for that, it is considered a key specie.

The egyptian mongoose (*Herpestes ichneumon*) and the red fox (*Vulpes vulpes*) are two of the most common carnivores in Azambuja council and, allegedly, the ones that induce the wild rabbit population decrease, together with viral diseases and intensive agriculture [2, 8]. For this reason and to prevent damages, are carried out actions to control the carnivore population numbers, on hunting, agriculture and forest areas. So, the purpose of this study was to describe the capture process end-to-end: how the authorization is required, how is it done in the field, how the fiscalization is made and the results on the biodiversity. For that, the national's authorities responsible for the analysis, authorisation and surveillance were consulted and a local hunting association, that was carrying population control actions, was interviewed and accompanied in the field.

2. The species

The red fox is one of the most common carnivores in Portugal. Belongs to the Canidae family and it's characterised by a reddish or greyish fur on the back, white back and the tail is long and with tufts. Is a night specie and habits mostly forest, scrubland and agriculture areas [3] (Fig. 1).

The egyption mongoose is also a carnivore and the only mongoose specie in Europe and

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exclusive for the Iberian Peninsula. Belongs to the Herpestidae family and it's characterised by a uniform, mingled, dark fur, a pointy and large tail, paws proportionally shorter to the body, nails not retracted and used for digging [4] (Fig. 2).

Figure 1- Red Fox (Source: Naturdata © Fernando Romão)

3. The study area

The Azambuja council is the most eastern council in the Lisbon district, in Portugal, and it is the most densely populated along the rail/road lines (Fig. 3).

Figure 2 - Egyption mongoose (Source: http://fotos.sapo.pt/greenbit/fotos/?uid=tdZon46vH4SBNkTZjFqC)

The landscape is dominated by olive and fruit trees, vineyards, and limited in the north by *Pinus Pinaster, Pinus pinea, Eucalyptus globules, Quercus suber* and *Quercus faginea,* in the south by Ribatejo marshlands and in the west by the Montejunto Mountain rage.

The river in area is the biggest river in Portugal, the Tagus River.

In geological terms, prevails the sedimentary rocks, sandstone, conglomerates and clay. These conditions provide a preferential habitat for the species in study: low population density/human pressure, sand terrains that enable them to dig burrows and access to water and food. Supporting this statement, there are twenty three hunting areas in the council.

Figure 3- Azambuja's council environment map. Above the council is highlighted in red Source LNEG, National Laboratory on Energy and Geology. The below map is a satellite photo (Google Maps)

4. Applicable Legislation

Red fox and egyption mongoose are considered small game hunting and their capture is allowed on the hunting season, from October to February.

If necessary, to prevent or minimize damages on flora, fauna, fishing, forest, agriculture, livestock, health protection and/or public security, their capture is possible (predator population control), provided they are authorized by the Institute for the Conservation of Nature and Forests (ICNF) [5]. The enforcement and surveillance are

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responsibilities of the Nature and Environment Protection Service (SEPNA) from the National Republican Guard (GNR).

5. Results

The process starts with a request from the hunting association to ICNF in which is requested a predation population control, specified to the red fox and egyptian mongoose, the damage or endangered area and the means that are going to be used during the activity. The most frequent one is by the use of live animal cage trap (figure 4). The bait used in cages is a dead rabbit or a piece of pork rind (figure 5).

After an information request, ICNF informed that the criteria are:

i. the substantiation of the request according the law;
ii. adequacy of the request in relation to the area;
iii. reports with results of prior actions, in which the association has to quantify the captured animals and cages involved.

On the request, the hunt association propose to place a number of cage traps (the limit allowed is ten cage traps). If the request doesn't mention a proposal, ICNF only allows the placement of six cage traps.

This authorization is sent to SEPNA who is responsible for ensure that:

(i) the numbers of cage traps don't exceed the one given in the authorization,
(ii) that only the species authorized are the ones captured and killed,
(iii) That the cages are placed only in authorized area.

There is no reference on the request or in the authorization to a limit number of captured animals. After consulting ICNF, it was referred that due to the fact that there was no studies that evaluate or provide knowledge about these species population density on a specific region or hunting area, the justification is an applicant's responsibility (the hunt association).

We've contacted SEPNA and after received information request, notice that in the past years, the authorizations are standardized and ad-hoc, that doesn't exists a compliance record of the amount of captured animals or an impact study for this activity. It has also indicated that the elevated number of hunting areas on the Azambuja council and on the surrounding ones, allied to the fact that the hunters are familiarized with the terrain and a small team to check all ones, translates in a deficient surveillance.

Figure 4- Live animal cage trap (photo captured in field)

In fact, for the attended association (hunt association where we've donned the work), was only allowed the placement of 5 cages and during the record in field, the number of cage traps seen exceeded by far this number. In fact we've counted 17 cages.

It is important to note that the main activity of hunting associations is to hunt wild rabbits, in the study area. If rabbits do not exist or the population is reduced, no one hunts and so, the dues aren't going to get paid by the members, putting in jeopardy the association's existence.

7. Discussion

In Portugal, the economic interests still remain as one of the greatest obstacles to environment protection and existing biodiversity maintenance. Given that Azambuja council holds intense cinegetic activity, and also the fact that these two species are the most commons targets of overpopulation control, understanding the impact of these actions, along the food chain and on local biodiversity, became the purpose of this work.

The overpopulation control action, itself, is a solution if a species number gets so big, that causes habitat unbalance. And in fact, in a community where predating is intensive, a negative pressure under the food web, is

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expected. In this case, the prey is the wild rabbit, which could mean significant changes on the community structure, given the fact that key species have the ability to determine expressive variations on the species abundance on their habitat or even their extinction.

Figure 5 – Baits used in cages. (photos captured in field

Rabbit population have declined due for instance to diseases and land use changes (Viñuela and Villafuerte *2004 in* Beja *et al.*, 2009) [8]. In fact several diseases were discover in Portugal such as *Mycobacterium bovis* Infection in Red Foxes (*Vulpes vulpes*) with cerebral involvement (Matos *et al*., 2014) [9] and *Mycobacterium avium* subsp. *paratuberculosis* in red fox and Egyptian mongoose (Matos *et al*., 2014) [10]. Cardoso *et al.* (2014) [11] also found *Hepatozoon canis*, a protozoan tick-borne pathogen of dogs and wild canids, in ref fox in Portugal.

The most used method for the overpopulation control is the cage trap. There are other methods but they are most suitable for areas where there are focused points, like agriculture or domestic animal damage: the area delimitation in not a solution, given their size and cost, and wouldn't give practical results because only prevents the carnivore's approach; the burrows fumigations to kill the cubs implies the knowledge of their location and, again, given the area size it isn't doable and, the use of venom isn't a selective method.

Either way, the assumption for these actions, is that the number of fox's and egyption mongoose is so high, that preventive or correction actions are needed. What has been observed and confirmed in the field and after the interviews, is that there's absolutely no data that testify/proves that situation, and we are watching an indiscriminate slaughter of these species, awarded by the agency that should protect them.

It would be expected that the government agency responsible for forest and nature protections, and plus with conservationists purposes, permitted these actions only as a last measure and only in possession with unquestionable data that proves an existing or soon to be agriculture and/or biodiversity impact, but in fact they direct the responsibility to the hunting associations. If the purpose of these actions is to reduce carnivore density, then the number of animals whose death is authorized should be the primary indicator on it, to establish the limit number on which the balance is restored between predators and system capacity. By not doing this, the authorities are tacitly approving the unlimited slaughter of these species as it is only referred the number of cages to be used and the period in this action can be occurred. As a single point of reference, prairie dogs that where assumed as a plague, are now endangered and systematic population control actions, are pointed as a main cause for that [6].

On the other hand, there is no prove that the rabbits population decrease is a result of an intense predating from the red fox and egyption mongoose, just because they're not the only prey of this animals and the mortality provoke by viral diseases is considerable.

Kirkwood et al. (2014) [7] mentioned that "both predator and prey populations should be monitored concurrently because the relationship between predator abundance and impact on prey species is not necessarily

density dependent".

Lozano *et al.* (2013) [12] concluded that predator control can play a role in altering the carnivore communities; red fox numbers can increase due to control and predator control programs should evaluate the potential of unintended effects on ecosystems.

Given the above, mitigate and preventive measures are needed. Habitat surveys and characterization, regional planning, species limiting factors and annual population species census, are extremely important. The only existing studies about these species considered only geographic distribution and these works are dependent of hunting associations, who supply the data. Carrying descriptive and, most important, exempted works that provide trustful and critical information to the decision makers, and mostly engage awareness within society to these actions, is critical.

Barrull *et al.* (2011) [13] mentioned that traditional way to deal with hunting interests is often focused on predator control. A study done by Beja *et al* (2009) [8] showed much higher abundances of small game species in game estates than elsewhere.

As a result, overpopulation control actions and, until preventive measures as the suggested above are taken, should only be used as a last resort, constituting the exceptional action in accordance with the law.

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